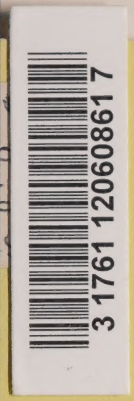

REGULATION MADE UNDER

E OCCUPATIONAL HEALTH AND SAFETY ACT

DIVING OPERATIONS

O. REG. 634/86

Filed - October 30, 1986
Effective - January 29, 1987

This edition is prepared for purposes of convenience only, and for accurate reference recourse should be made to the official volumes.

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INTERPRETATION

1. In this Regulation,

"ambient pressure" means the external pressure on the body of a diver;

"atmospheric diving system" means a diving system in which the ambient pressure for the person using the system is normal atmospheric pressure;

"bail-out system" means an independent breathing-gas supply carried by the diver, of sufficient quantity to return the diver to the surface, bell or emergency supply in the event of a malfunction of the primary gas supply;

"bottom time" means the total elapsed time, measured in minutes, from the time a descending diver leaves the surface to the time the diver begins final ascent, rounded to the next whole minute;

"buddy line" means a line consisting of polythene rope, 7 millimetres in diameter and 3 metres in length that can be securely attached to each diver;

"closed bell" means a submersible compression chamber;

"decompression table" means the procedure that a diver follows during the ascent from depth in order to minimize the risk of decompression sickness;

"decompression sickness" means a disease caused by the formation of gas bubbles in the blood or body tissues as a result of pressure reduction;

"deep diving operation" means any mode of diving to depths greater than 50 metres;

"Director" means the Director of the Construction Health and Safety Branch of the Ministry of Labour;

"diver" means a worker who performs work under water;

"diving bell" means a surface-tethered structure that can accommodate divers under water;

"diving operation" means work performed underwater for commercial, industrial, construction or environmental purposes and includes the underwater inspection, alteration, repair or maintenance of equipment, machinery, structures or ships and the salvage of sunken property of a commercial or industrial nature;

"diving plant and equipment" means all plant and equipment that form part of the life-support system of a diver;

"diver's tender" means a worker who tends divers;

"diving supervisor" means a competent person having complete responsibility for a diving operation, including responsibility for the safety and health of all diving personnel;

"free swimming" means diving while using S.C.U.B.A., with the divers supervised but not tethered to the surface by a lifeline or float;

"hyperbaric chamber" means a pressure vessel and associated equipment designed for the purpose of applying greater than atmospheric pressure on the body of a diver;

"lifeline" means a manilla rope 19 millimetres in diameter having a breaking strength of not less than 2,454 kilograms;

"life-support hose bundle" means a composite hose and cable or separate cables extending from the surface to the diver or to the pressure vessel of occupancy of the diver that supplies breathing gas, power, heat or communication as required;

"liveboating" means the support of a surface-supplied diver from a vessel under way, but does not include towing the diver;

"locked-out" means made inoperable by means of a padlock for which the key is held only by a person authorized by the diving supervisor;

"lock-out submersible" means a self-propelled, tethered or untethered, submersible compression chamber from which a diving operation can be carried out, and that has a separate 1-atmosphere chamber from which the submersible is piloted;

"mixed gas" means a respirable breathing mixture, other than air, that provides adequate oxygen to support life and does not cause detrimental physiological effects, particularly excessive breathing resistance or impairment of neurological function;

"no decompression limit" means that, in accordance with the diving decompression table in use for the depth and duration of the dive, no decompression stop is required during the ascent;

"open bell" means a surface-tethered structure that can accommodate divers underwater and is fitted with an on-board life-support system;

"saturation diving" means a technique of diving in which the decompression table used allows a bottom time of unlimited duration;

"S.C.U.B.A." means a self-contained underwater breathing apparatus and includes a self-contained open-circuit compressed air breathing apparatus;

"stage" means a cage, basket or platform in which a diver may be lowered to or raised from a work site;

"stand-by diver" means a diver who is fully equipped to dive and is ready to enter the water, with all life-support and communications equipment tested and at hand, but not necessarily with the helmet, face plate or face mask in place, trained and equipped to operate at the depths and in the circumstances in which the submerged diver is operating and prepared to render assistance to the submerged diver in the event of an emergency;

"submersible compression chamber" means a hyperbaric chamber designed for transporting divers at atmospheric pressure or at an elevated pressure from the surface to the work site and vice versa, and includes untethered lock-out submersibles;

"surface-supply diving" means a diving technique in which the diver is supplied from the dive location with a breathing mixture, by way of an umbilical;

"therapeutic recompression" means the recompression treatment of a diver in accordance with appropriate tables and practices;

"umbilical" means a life-support hose bundle;

"vessel under way" means a vessel that is not at anchor, made fast to the shore or a fixed structure, or aground;

"work site" means an underwater location where work is performed.

PART I - GENERAL

APPLICATION

2. This Regulation applies to every employer, supervisor, worker and constructor engaged in a diving operation.

EQUIVALENCY

3. In applying this Regulation, a procedure and the composition, design, size and arrangement of any material, object, device or thing may vary from the procedures, composition, design, size or arrangement prescribed in this Regulation if the factors of strength, health and safety are equal to or greater than the factors of strength, health and safety in the procedure, composition, design, size or arrangement prescribed.

DUTIES OF EMPLOYERS AND CONSTRUCTORS

4. The constructor of a project in which a diving operation is to take place and an employer who will be engaged in a diving operation shall before commencing the diving operation,

(a) notify the Director by telephone of the location and duration of the diving operation and confirm this notification in writing to the Director;

(b) notify the Director in writing prior to the use of mixed gas diving operations, a copy of which shall be available on the dive site for inspection;

(c) notify harbour masters and where it is necessary in the interests of safety, notify navigable water authorities, police departments, fire departments and upstream or

adjacent industrial plants producing probable contamination, that a diving operation is to take place and the location thereof, a copy of which shall be available on the dive site for inspection;

(d) appoint in writing a diving supervisor; and

(e) set out in writing the operational procedures to be used on the diving operation and a contingency plan for emergencies, a copy of which shall be available on the dive site for inspection.

DUTIES OF SUPERVISORS

5. (1) The diving supervisor shall be in direct control of the diving operation and shall take every precaution reasonable in the circumstances for the protection of a diver.

(2) Without limiting the generality of subsection (1), the diving supervisor shall,

(a) establish a diving plan which shall be submitted in writing to the employer before commencement of the diving operation;

(b) advise the workers of the diving plan and of the emergency procedures that are to be followed in the event of a malfunction of the equipment or system;

(c) ensure that the diver is competent to perform the work;

(d) immediately before each dive, review the nature of the hazards in the work site and ensure that the diver fully

understands the hazards involved as well as those likely to be encountered in the diving operation;

(e) ensure that,

(i) all necessary equipment and diving plant, including umbilicals, winches, cables, chambers and motors used in a diving operation are provided and maintained in good operating condition and examined daily by a competent person;

(ii) there are a sufficient number of competent persons at the dive site;

(iii) breathing gas is free of contamination; and

(iv) the diving operation is conducted from a suitable and safe place;

(f) when diving operations are in progress, ensure that appropriate warning devices are displayed to define the area to be kept clear of any equipment other than that connected with the diving operation;

(g) ensure that a stand-by diver is present at all times when diving operations are in progress;

(h) except in the case of accident or unavoidable circumstances, ensure that a diver is not permitted to remain at any depth longer than the maximum time planned for the depth of the dive;

(i) supervise all therapeutic recompressions;

(j) while acting as supervisor, not dive except in an emergency; and

(k) terminate or interrupt the diving operation if, the diving supervisor's opinion, continuance of the operation is likely to endanger the health or safety of any worker engaged in the operation.

DUTIES OF DIVERS

6. (1) Every diver shall ensure and the diving supervisor shall be satisfied that the signals and procedures in use and, where applicable, the duties and instructions of the diving partner and all others with whom the diver works, are completely understood.

(2) A diver shall not dive unless,

(a) the diver has undergone a medical examination as prescribed in subsection 34(1) and has submitted to the employer the written statement of the physician obtained in accordance with subsection 34(4);

(b) the diver is not physically or emotionally fatigued;

(c) the diver has not consumed alcohol or drugs which would impair his diving abilities; and

(d) the diving supervisor is satisfied that the diver is capable of functioning safely and effectively under water.

(3) A diver shall inform the diving supervisor if he or she is unfit to dive.

(4) Immediately before each dive, the diver shall check that all required equipment is in place and properly fastened and all apparatus is functioning.

(5) Before descent, the same check as that required in subsection (4) shall be conducted in the water by the diver.

(6) On completion of any dive that does not require decompression, the diver shall remain under observation for a period of time sufficient, in the opinion of the diving supervisor, to ensure the welfare of the diver.

(7) On completion of any dive requiring decompression stops, the diver shall remain under observation in the general area of the hyperbaric chamber for a minimum period of one hour. This period of observation shall be extended if, in the opinion of the diving supervisor, it is necessary to ensure the safety of the diver.

(8) A diver shall not fly in any aircraft at an altitude exceeding 300 metres above sea level for twenty-four hours after completion of any decompression.

(9) A sturdy medical alert tag or bracelet displaying the words, "DIVER - IN CASE OF EMERGENCY TAKE IMMEDIATELY TO A HYPERBARIC FACILITY", shall be worn by each diver for at least twenty-four hours after completing each dive.

DUTIES OF STAND-BY DIVERS

7. Every stand-by diver shall,

(a) be trained and equipped to operate at the depths and in the circumstances in which the submerged diver is operating;

(b) either at the surface diving base or in the diving bell, have a stand-by umbilical or a lifeline that shall be,

(i) of sufficient length to reach an operating diver in all cases, and

(ii) where the umbilical or lifeline attached to the operating diver has not become separated from the diver's tender, at least 3 metres longer than the umbilical or the lifeline of the operating diver;

(c) only enter the water in the event of an emergency; and

(d) be positioned so as to be capable of rendering immediate emergency assistance at all times.

PART II - EQUIPMENT

DIVING EQUIPMENT

8. (1) All diving equipment including breathing apparatus, compressors, compressed-gas cylinders, gas control valves, pressure gauges, reserve gas-supply devices, piping, helmets, winches, cables, diving bells or stages and all other accessories necessary for the safe conduct of the diving operation shall be,

(a) of sound construction, adequate strength and free from patent defect;

(b) maintained in a condition that will ensure its continuing operating integrity and suitability for its actual use;

(c) adequately protected against malfunction at low temperatures that may be caused by;

(i) ambient air or water, or

(ii) the expansion of gas; and

(d) examined, tested, overhauled and repaired in accordance with the manufacturer's recommended procedures.

(2) Record books shall be kept for breathing apparatus, compressors, compressed gas cylinders, gas control valves, pressure gauges, reserve gas-supply devices, piping, helmets, winches, cables and diving bells or stages, and servicing and repairs thereto shall be entered in the records and dated and signed by the persons performing the examination, servicing and repairing.

(3) The record books shall be kept for a period of one year after the equipment is no longer used.

SURFACE DIVING BASE EQUIPMENT

9. (1) When diving is in progress, a surface diving base shall be equipped with,

(a) if S.C.U.B.A. is being used, one complete spare set of underwater breathing apparatus with fully charged cylinders for emergency purposes only;

(b) an adequate quantity of oxygen for therapeutic purposes;

(c) one shot-line of weighted nineteen millimetres manilla of sufficient length to reach the bottom at the maximum depth of the work site;

(d) a first-aid kit appropriate for the size of the work crew and diving location;

(e) one complete set of decompression tables;

(f) a suitable heated facility for the use of workers that is located on or as near as possible to where the dive is to be made;

(g) a two-way communication system between the surface diving base and emergency services; and

(h) such other equipment as may be necessary to protect the health and safety of a worker.

(2) All surface diving bases that are vessels shall be equipped with,

(a) a secondary means of propulsion; or

(b) a secondary means of transporting an injured diver.

LIFELINES

10. Lifelines shall,

(a) be free from patent defect, maintained in a condition that will ensure its continuing operating integrity and be free of knots and splices;

(b) when required to be used, be worn at all times by a submerged diver;

(c) fit snugly around the diver's waist under all of the diver's equipment except the exposure suit or be securely attached to the diver's safety harness;

(d) be no longer than is necessary to perform the work;

(e) be secured at the surface to a safe point of anchorage;

(f) be secured in a manner that will prevent loss of contact with the diver; and

(g) be tended at all times by a diver's tender or tethered to an identifiable float located on the surface.

COMMUNICATIONS

11. (1) Subject to subsection (2), the diving supervisor shall ensure that a two-way effective communication system by voice or by pre-arranged line signals is provided between every submerged diver and any person in control of plant and equipment that may assist the diving operation.

(2) The two-way communication provided between the submerged diver and any person in control of plant and equipment shall be by voice when the depth of the dive exceeds or is intended to exceed thirty metres.

(3) A voice communication system shall provide,

(a) a standard of sound reproduction adequate to enable the diver's breathing to be clearly heard;

(b) a suitable means of voice-unscrambling when breathing mixtures containing helium or other gases that significantly distort sound transmission are being used; and

(c) a recording system for voice communications for depths exceeding fifty metres;

(4) In addition to the primary communication system required under subsection (1) an emergency signal shall be established.

ADDITIONAL DIVER'S EQUIPMENT REQUIREMENTS

12. Every diver shall be equipped with,

(a) diver's indicator devices, such as rescue beacons or strobes, where S.C.U.B.A. diving operations are to be carried on during the hours of darkness; and

(b) a strong, sharp knife.

Note: It is recommended that a diving harness complete with lifting ring be worn by each diver.

HOISTING DEVICES

13. (1) A hoisting device used to lower a diver shall not be used for any other purpose until after the diver is in position.

(2) All directions to the operator of the hoisting device shall be given by the diver, the diver's tender or the diving supervisor, but the signal to stop may be given by any person.

(3) A diver being hoisted shall be,

(a) in continuous visual contact with the diving supervisor by the use of pre-arranged visual signals; or

(b) in contact with the diving supervisor by the use of a telecommunication system when visual signals are not practicable.

(4) A hoisting device used to raise or lower a stage or submersible compression chamber shall,

(a) be so constructed that a brake is automatically applied when the control lever, handle or switch is not held in the operating position; and

(b) not be fitted with a pawl-and-ratchet gear on which the pawl must be disengaged before the commencement of raising or lowering operations.

STAGES

14. A stage shall,

(a) be large enough to carry at least two divers with their personal diving equipment and associated equipment in uncramped conditions;

(b) be secure against tipping and spinning;

(c) not contain any equipment that might interfere with an occupant's foothold or handhold; and

(d) be so constructed or equipped that the occupants are secure against falling out of the stage.

OPEN DIVING BELLS

15. Open diving bells shall,

(a) be of sufficient size to accommodate all submerged divers;

(b) provide adequate emergency breathing gas for the safe decompression of divers in an emergency; and

(c) have a voice communication system which allows contact with surface supervisory personnel.

HYPERBARIC CHAMBERS

16. (1) Subject to subsection (2), a hyperbaric chamber, Class A of a double-lock type in operable condition shall be on site where a diving operation is to exceed,

(a) the no-decompression limit; or

(b) a depth of thirty metres.

(2) A hyperbaric chamber shall be on site regardless of depth or decompression limits where it is reasonable in the circumstances for the protection of a diver.

(3) Where a dispute arises between an employer, a diving supervisor or a diver as to the requirement for a hyperbaric chamber under subsection (2), the employer, diving supervisor or diver may notify an inspector who shall investigate and give a decision, to be confirmed in writing, to the employer, the diving supervisor or the diver, as appropriate, that shall determine the dispute.

Note: Hyperbaric chambers operated in accordance with the requirements of Canadian Standards Association Standard Z275.1-M1982, Hyperbaric Facilities complies with the intent of this section.

FIRE PREVENTION

17. The hyperbaric chamber shall be equipped with adequate fire prevention.

Note: Adherence to Clause 8 of the Canadian Standards Association Standard Z275.1-M1982, Hyperbaric Facilities complies with the intent of this section.

LIGHTING

18. (1) Where possible, sources of hyperbaric chamber illumination shall be mounted outside the pressure chamber and arranged so that the light is transmitted to the interior by fibre optic techniques.

(2) Where externally mounted lamps are employed for illumination of hyperbaric chambers through view ports, suitable heat shields shall be incorporated to prevent the view ports from heating excessively during use.

Note: Adherence to the requirements of Canadian Standards Association Standard Z275.1-M1982, Hyperbaric Facilities complies with the intent of this section.

SUBMERSIBLE COMPRESSION CHAMBERS

19. All submersible compression chambers shall conform to the requirements of Canadian Standards Association Standard Z275.1-M1982, "Hyperbaric Facilities", and shall,

(a) be of a design that,

(i) enables divers to enter and exit without difficulty, and

(ii) allows at least two divers that are equipped and dressed for the diving operation to be seated within;

(b) be equipped to permit the transfer of personnel under pressure into or from the surface hyperbaric chamber;

(c) be used in association with lifting gear that enables the chamber to be lowered to the depth at which the diving operation is to be carried out, without excessive lateral, vertical or rotational movement taking place;

(d) be provided with a means whereby, in the event of a failure of the main lifting gear, the chamber can be returned to the surface and, where such means involve shedding of weights, the controls for such shedding shall be capable of operation from within the chamber and a means shall be incorporated to prevent accidental shedding of these weights; and

(e) be equipped with,

(i) doors or hatches that act as pressure seals and may be opened from either side,

(ii) such valves, gauges and other fittings as are necessary to control the internal pressure and to clearly indicate the internal and external pressures inside the chamber and at the diving station,

(iii) adequate equipment, protected against inadvertent operation, for supplying the appropriate breathing mixture to persons occupying or working from the chamber,

(iv) a voice communication system whereby conversation may be maintained both with persons at the diving station and with divers outside the chamber,

(v) appropriate lighting equipment,

(vi) adequate first-aid equipment and lifting equipment sufficient to enable an unconscious or injured diver to be hoisted into the chamber by a person located within,

(vii) a diver's umbilical which shall be limited to thirty metres,

(viii) a strobe,

(ix) a location pinger of 37,000 Hz.,

(x) oxygen and carbon dioxide monitors, and

(xi) primary and secondary carbon dioxide scrubbers.

LOCK-OUT SUBMERSIBLES

20. A diving operation shall not be conducted from a lock-out submersible unless,

(a) the submersible is negatively buoyant on the bottom or positively secured to the work site;

(b) the diving supervisor is on board the submersible and present in the 1-atmosphere chamber during the diving operation;

(c) in addition to the diving supervisor there is at least one other diver monitoring the diving operation from the

lock-out submersible and dressed and equipped to carry out emergency diving operations without prior notice; and

(d) the diver's umbilical is limited to 30 metres.

BREATHING MIXTURES - GENERAL

21. A diving operation shall not be undertaken unless,

(a) an adequate quantity of the appropriate breathing mixture, including a reserve supply 2.5 times that required for the operation, and suitable plant and equipment for supplying the mixture to a diver at a proper temperature, pressure and flow rate are available for use by every diver engaged in the operation;

(b) an adequate quantity of an appropriate breathing mixture is available for therapeutic purposes; and

(c) when a submersible compression chamber is being used, an additional reserve supply of the appropriate breathing mixture, adequate for a duration of seventy-two hours, together with any necessary plant and equipment, is available.

BAIL-OUT SYSTEMS

22. An appropriate breathing mixture shall be in the bail-out system carried by a diver.

QUANTITIES

23. The quantity of breathing mixture supplied for use by a diver shall be sufficient for the time needed by the stand-by diver to reach the diver and for both divers to,

(a) return to the surface and carry out the appropriate decompression procedures during the return; or

(b) return to a submersible compression chamber, if such is being used in the diving operation, and then to surface in that chamber and start the appropriate decompression procedures at the surface.

NON-STANDARD GASES

24. (1) When gases mixed in proportions other than the normal proportions of respirable air are used, the employer shall ensure that the procedures and tables of decompression are appropriate for the mixture in use.

(2) A diver shall not be given pure oxygen for breathing except for decompression or therapeutic purposes.

PURITY OF BREATHING MIXTURES

25. Breathing mixtures of air shall adhere to section 3.8 of Canadian Standards Association Standard Z275.2-M1982 "Occupational Safety Code for Diving Operations".

GAS SUPPLY

26. Compressed air supplied to a diver shall meet the requirements of Canadian Standards Association Standard Z180.1-M1978, "Compressed Breathing Air".

COMPRESSOR REQUIREMENTS

27. (1) Compressors used to supply air to divers shall be capable of maintaining a supply of air equal to at least double the volume of air required and at a pressure 25% greater than the maximum pressure requirement anticipated and shall operate automatically without undue fluctuation of pressure in the air-tank receiver.

Note: Adherence to Canadian Standards Association Standard B51-M1981, Code for the Construction and Inspection of Boilers and Pressure Vessels complies with the intent of this section for all tanks, fixtures and fittings used in connection with compressors.

(2) Compressors supplying breathing gas or air to divers shall discharge the gas or air through adequate filters into a tank or receiver of suitable volume.

COMPRESSOR OPERATOR

28. (1) Compressors shall be operated by a competent person who may be the diver's tender.

(2) The operator of the compressor shall ensure,

(a) that all equipment necessary to supply an adequate quantity of air to the diver is in good working order; and

(b) that valves, stop-valves, drain-cocks, gauges and all parts liable to damage are operating properly.

OXYGEN INSTALLATIONS: HOSES

29. Hoses and associated fittings shall be constructed of material that is compatible with oxygen at the operating pressure and temperature.

FLOW VELOCITY

30. High flow velocities of oxygen through hoses shall be such that the differential pressure along a hose does not exceed 700 kPa.

VALVES

31. Quick-opening valves such as ball valves shall not be used in oxygen systems except for emergency shut-off at the point of penetration of a hyperbaric chamber hull.

OXYGEN STORAGE AREA

32. An area where oxygen is stored shall be,

(a) adequately ventilated;

(b) properly identified with warning signs;

(c) equipped with a fire-suppression system; and

(d) kept clean and located as far as practical from combustible materials.

Note: Adherence to Canadian Standards Association Standard Z275.2-M1982 complies with the intent of this section.

CHECKING OF GAUGES AND METERING EQUIPMENT

33. (1) Gauges and metering equipment shall be checked at least once every 6 months and whenever a discrepancy is indicated.

(2) Any malfunction of a gauge or metering equipment shall be rectified immediately or removed from service.

(3) If a gauge or metering equipment is removed from service, it shall be identified as having a malfunction.

PART III - MEDICAL AND EMERGENCY PROCEDURES

MEDICAL REQUIREMENTS OF DIVERS

34. (1) A diver shall undergo a medical examination annually or such shorter period as is specified by the examining physician.

(2) A diver shall, at the expense of the employer, undergo a medical examination where the diving supervisor has reason to believe that the diver is unfit to dive or where there are special hazards that the diving supervisor has reason to believe may endanger the health of the diver.

(3) The medical examination required under subsection (1) or (2) shall meet the requirements of the Code for Medical Examination of

Divers dated the 24th day of October, 1984 and issued by the Ministry.

(4) The physician conducting the medical examination shall provide the diver with a written statement certifying that the examination was conducted in accordance with the Code for Medical Examination of Divers and that the diver is fit, fit with limitations; or unfit for diving.

EVIDENCE OF COMPETENCY

35. (1) Every diver and at least one worker stationed at the surface shall be trained in cardio-pulmonary resuscitation, basic first aid and the emergency treatment of diving ailments.

(2) Where deep water or remote diving operations are to be conducted, one member of the dive team shall,

(a) be trained as a medical attendant to divers; and

Note: (i) Agencies for certification include but are not limited to: the Canadian Heart Foundation, the Canadian Red Cross, and St. John's Ambulance;

(ii) It is recommended that all supervisors and diver's tenders be trained and certified in the above techniques.

(b) be available to provide immediate medical assistance in the event of an emergency.

MEDICAL STAND-BY

36. The employer shall arrange for a physician to be on call during a diving operation,

    (a) to provide medical assistance in the event of an emergency; and

    (b) to provide advice on the treatment of decompression sickness.

BACK-UP HYPERBARIC FACILITIES

37. The employer shall identify the location of the nearest back-up hyperbaric facility suitable for the depth at which the diving operation is to be carried out and shall make arrangements for the use of this facility in the event of an emergency.

EMERGENCY PROCEDURE - TERMINATION OF DIVE

38. At the onset of any sign of malfunction of gear or sign or symptom of distress, the diver shall, when possible, notify the diver's tender and any diving partner by an appropriate signal and shall terminate the dive.

DECOMPRESSION PROCEDURES AND TABLES

39. Diving operations, repetitive dives and treatment of divers shall be carried out in strict accordance with appropriate decompression procedures and tables.

ALTERNATIVE ENERGY SOURCES

40. (1) The employer shall ensure that there is a second source of power for the diving system in the event of failure of the primary source.

(2) The second power source shall be capable of,

(a) being rapidly brought on line;

(b) operating the handling system for the submersible compression chamber;

(c) heating the diving plant and equipment, including heating for a diver in the water;

(d) sustaining life-support systems for compression chambers and any diver in the water;

(e) illuminating the work site of the diver and the interior of each compression chamber, dive station and other similar equipment; and

(f) operating communication and monitoring systems.

ATMOSPHERIC DIVING SYSTEMS

41. (1) Where an atmospheric diving system is to be used, the employer shall locate the nearest back-up unit with sufficient depth capabilities to effect a rescue and shall arrange for its use in the event of an emergency.

(2) An atmospheric diving system shall not be used unless the on-board reserve life-support system is capable of sustaining life for a

period of time that would enable the back-up unit to reach the site of the diving operation and conduct rescue operations.

(3) The employer shall provide a written contingency plan with methods for dealing with,

(a) deteriorating weather and ice conditions during a dive;

(b) the inability of the surface craft to maintain station;

(c) failure of any major component of diving plant and equipment; and

(d) any other hazard that may reasonably be anticipated.

PART IV - S.C.U.B.A. DIVING

APPLICATION

42. (1) This Part applies to diving operations in which a diver uses S.C.U.B.A.

(2) Where S.C.U.B.A. that provides other than normal air mixtures or recirculating apparatus is used on a diving operation, written notice shall be given to the Director, a copy of which shall be available on the dive site for inspection and the diver shall be competent and adequately trained in the use and hazards of the S.C.U.B.A.

MINIMUM CREW

43. (1) Subject to subsection (2), a sufficient number of workers shall be present for each diving operation to ensure, so far as is reasonably practical, that the operation can be undertaken safely.

(2) A minimum of three workers shall be present at each dive site, one of whom shall be a diver, one a stand-by diver and one a diver's tender.

LIFELINES AND BUDDY SYSTEM

44. (1) A diver using S.C.U.B.A. shall use a lifeline tended at the surface or tethered to an identifiable float located on the surface and tended at the surface where,

(a) the diver is diving alone; or

(b) the buddy system of diving cannot be used safely.

(2) Work that cannot be performed safely in a tethered mode shall be performed by a diver swimming free and accompanied by another diver who is tethered.

(3) The buddy system of diving shall consist of two divers each of whom shall,

(a) be responsible for the other's safety;

(b) maintain constant visual contact of the other during the dive;

(c) know the hand signals being used and acknowledge each signal as given;

(d) not leave the other except in the case of emergency requiring the assistance of one of them; and

(e) abort the dive immediately if one becomes separated from the other, or one of them aborts the dive.

(4) A lifeline tended from the surface shall be used at all times in a diving operation that is to be carried out under ice.

MAXIMUM DEPTH

45. A S.C.U.B.A. diver shall not dive to depths greater than 30 metres except for the purpose of saving a life.

DIVING EQUIPMENT

46. (1) A diver using S.C.U.B.A. shall, for each dive, use or wear,

(a) except where a S.C.U.B.A. mentioned in subsection 42(2) is used, an open-circuit S.C.U.B.A. complete with demand regulator and tank with quick-release harness and reserve device or bail-out system;

(b) a face mask;

(c) a suitable knife;

(d) a submersible pressure gauge; and

(e) an exposure suit or protective clothing appropriate for the condition of work and the temperature of the water.

- **Note:** Clause 6.8 of the Canadian Standards Association Standard Z275.2-M1982, Occupational Safety Code for Diving Operations, includes additional equipment—fins, snorkel, weight belt, manually inflated buoyancy device and underwater watch, which are considered as optional equipment that may be used or worn by a diver.

TESTING OF CYLINDERS

47. (1) Each S.C.U.B.A. cylinder shall be hydrostatically tested as required by Transport Canada, for the specific type and construction, at a station licensed by the Canadian Transport Commission.

(2) At least once a year each S.C.U.B.A. cylinder shall be visually inspected internally and externally by a competent person.

Note: S.C.U.B.A. cylinders should be cared for and stored in the manner recommended in CSA Standard Z180.1, Compressed Breathing Air.

PART V - SURFACE-SUPPLY DIVING

APPLICATION

48. This Part applies to surface-supply diving.

MINIMUM CREW

49. (1) Subject to subsections (2) and (3) a sufficient number of workers shall be present for each diving operation to ensure, so far as is reasonably practical, the operation can be undertaken safely.

(2) Where the planned depth does not exceed 30 metres, a

minimum of three workers shall be present for each diving operation, of whom one shall be a diver, one a stand-by diver and one shall be a diver's tender.

(3) Where the planned depth exceeds 30 metres, a minimum of four workers shall be present for each diving operation of whom one shall be a diver, one a stand-by diver, one a diving supervisor and one a diver's tender.

DIVER'S TENDER

50. (1) A diver's tender shall be a competent person.

(2) Except as permitted in section 28, a diver's tender shall, while working as a tender, devote his or her whole time attention to the work as a tender.

(3) Except in an emergency, each diver in the water shall have a separate diver's tender.

AIR-LINES

51. (1) Stationary air-lines shall be properly safeguarded against injury or interference.

(2) A valve shall be fitted in each diver's air-line, which valve shall be,

(a) readily accessible;

(b) guarded against interference;

(c) clearly marked to identify the diver whose air supply it controls; and

(d) under the care and control of a competent person.

(3) Each air-line supplying air to a diver shall be fitted with a pressure gauge downstream of the supply valve and installed in such a position that its dial figures are in the clear and unobstructed view of the diver's tender.

(4) All hoses, pipes, couplings and other fittings in use in any air or gas supply line for divers shall be designed and suitable for their intended purposes.

(5) Hoses shall be kink resistant and be capable of sustaining the required flow rates and pressures for the systems used.

BAIL-OUT SYSTEM

52. Where surface-supplied equipment is to be used, a bail-out system shall be worn by the diver.

NON-RETURN VALVES

53. Non-return valves shall be,

(a) fitted in all diving helmets and surface-supplied masks; and

(b) checked daily, before the commencement of diving operations in accordance with the written instructions of the manufacturer.

LIFELINES

54. Every umbilical shall incorporate a lifeline attached in a suitable manner to prevent stress on the hose.

DIVING SUPPORT EQUIPMENT

55. When a diver is in the water, a vessel or platform shall be anchored at or near the operation or there shall be a diving platform, skip, pier, or facility that shall be seaworthy, secure and of sufficient size to safely accommodate all workers and equipment without overcrowding.

LIVEBOATING

56. (1) Liveboating from a surface vessel shall not be conducted at night or in rough seas or from vessels with insufficient manoeuverability.

(2) A procedure that prevents the diving umbilical from becoming entangled in the propellers shall be employed during a liveboating operation.

(3) The diver's tender for a liveboating operation shall be competent to perform this type of tending and shall be in contact with the diver at all times by means of a voice communication system.

(4) A boat captain shall,

(a) be competent to perform the duties of a captain in a liveboating operation; and

(b) perform his or her duties in compliance with the instructions of the diving supervisor.

PART VI - DEEP DIVING

APPLICATION

57. This Part applies to deep diving operations and includes bell, saturation, bounce (non-saturation), and submersible lock-out diving as well as sea bottom habitat dives.

GENERAL REQUIREMENTS

58. (1) The diver shall,

(a) be tethered to the work base by a breathing-gas umbilical; and

(b) be provided with effective two-way voice communication.

(2) Mixed gases shall be used as the breathing mixture in a deep diving operation.

(3) A deep diving operation shall not be carried out unless,

(a) the divers are transported through the air-water interface by a suitable submersible compression chamber, open bell or stage;

(b) the stand-by diver is located,

(i) at the discretion of the diving supervisor, at the surface, in a stage or in an open bell, or

(ii) where a submersible compression chamber is used, in the chamber,

(c) every diver and stand-by diver is in voice communication with each other and with the attendants at the diving station; and

(d) the attendants at the diving station have a means of monitoring and controlling,

(i) the depth of the diver, and

(ii) the pressures of the breathing medium being supplied to each diver and stand-by diver.

(4) Each submerged diver shall be tended by a diver's tender who shall,

(a) be located on a stage or open bell; or

(b) if a submersible compression chamber is used, be in the chamber.

(5) Where a submersible compression chamber is used, at least one diver shall remain in the chamber to monitor the diver who has left the chamber.

BOUNCE DIVING

59. (1) Where bounce diving techniques are used in a deep diving operation, the diving supervisor shall ensure that no diver remains submerged for a total period of time in excess of three hours in a twenty-four hour period and that there is a rest period of at least twelve continuous hours after this limit has been reached.

(2) Subject to subsection (3), where it is reasonable in the circumstances for the protection of a diver, a diving operation using

bounce diving techniques shall be carried out at depths greater than fifty metres and a maximum bottom time of forty minutes only if a submersible compression chamber or lock-out submersible capable of mating to a Class A (double-lock type) hyperbaric chamber for the transfer of personnel under pressure to and from the work site, is provided.

(3) A diving operation using bounce diving techniques shall be carried out at depths greater than seventy metres and a maximum bottom time of forty minutes only if a submersible compression chamber or lock-out submersible capable of mating to a Class A (double-lock type) hyperbaric chamber for the transfer of personnel under pressure to and from the work site, is provided.

(4) Where a dispute arises between an employer, a diving supervisor or a diver under subsection (2), the employer, diving supervisor or diver may notify an inspector who shall investigate and give a decision in writing to the employer, the diving supervisor or the diver, as appropriate, shall determine the dispute.

SATURATION DIVING TECHNIQUES

60. (1) Where saturation diving techniques are used in a deep diving operation, the diving supervisor shall ensure that,

(a) where the dive is to a depth of 150 metres, no diver exceeds four hours in the water and four hours as attendant in the submersible compression chamber;

(b) where the dive is deeper than 150 metres, no diver exceeds three hours in the water and three hours as attendant in the submersible compression chamber; and

(c) in any twenty-four hour period, there is a rest period of at least twelve continuous hours after the time limits specified in clause (a) or (b) have been reached.

(2) A diver shall not commence another dive within fourteen days of completion of decompression following a saturation dive unless authorized by a physician.

DEEP DIVING CREW

61. (1) For all deep diving operations there shall be a sufficient number of competent persons to,

(a) operate the diving plant and equipment and other facilities while any diver is under, entering or leaving the water; and

(b) operate any hyperbaric chamber and associated equipment required for the deep diving operation.

(2) A minimum of five workers shall be present for a deep diving operation of whom one shall be a diving supervisor, two shall be divers and two shall be diver's tenders.

(3) Except in an emergency, each diver in the water shall have a separate diver's tender.

(4) A diver's tender shall be a competent person and shall, while working as a tender, devote his or her whole time and attention to the work as a tender.

(5) A stand-by diver's tender shall be present on all deep diving operations.

(6) A hyperbaric chamber operator who is a competent person shall be a member of the crew.

(7) If more than one deep diving operation in a twenty-four hour period is planned, there shall be a sufficient number of competent crew to ensure that the diver and stand-by diver have not been exposed to pressure for a twelve hour period before commencing a dive.

(8) At least two divers shall be used when diving from a closed bell, one of whom shall tend the diver from the bell in accordance with subsection (4).

(9) A diving supervisor shall,

(a) be on-site during all deep diving operations;

(b) be responsible for all aspects of safety in conducting deep diving operations;

(c) be familiar and experienced with the diving equipment and tools used during the diving operations, the appropriate decompression tables and techniques and emergency procedures; and

(d) ensure that the divers are rested and capable of performing their tasks.

PART VII - SPECIAL HAZARDS

UNDERWATER INTAKES, PIPES, ETC.

62. (1) When a diver is required to approach any underwater intake, pipe, tunnel, or duct, the diver shall be equipped with means to

identify an intake in such a manner as to differentiate it from any other similar intake in the area.

(2) The diver shall not approach any intake until the flow through it is actively controlled and provisions are made so that the flow shall not be re-established until the diver leaves the water or until the diving supervisor has declared the diver clear of the hazardous location.

(3) Facilities such as head gates, stop logs or turbine gates shall be used for protecting divers when they are working near penstock or turbine intakes or in draft tube chambers.

(4) Where a diving operation is to be performed in a location in which the current is known to exceed 1.5 knots, the velocity of the water shall be determined.

(5) Where a diving operation is to be performed in water in which the velocity of the current exceeds 1.5 knots, the dive shall only be carried out when notice of the dive and the water velocity has been given to the Director, a copy of which shall be available on the dive site for inspection.

HAZARDOUS MECHANISMS

63. (1) Before a diver approaches a location that may be made hazardous by the operation of mechanisms, such mechanisms shall be,

(a) secured against inadvertent movement before the diver enters the water; and

(b) locked-out in a manner satisfactory to the diver and diving supervisor and adequate to protect the safety of the diver.

(2) Where exceptional hazards exist or are predicted, a second diving crew, with independent equipment, shall be on the site of the diving operation and ready to effect a rescue.

(3) In subsection (2), exceptional hazards include,

(a) an exceptional risk of entrapment of a diver;

(b) a special hazard to a diver; or

(c) an exceptional risk of loss of the diver's essential life-support system.

(4) Where explosives or blasting agents are to be handled in a diving operation, the explosive or blasting agent shall be transported, handled, used and stored in a manner that will not endanger the safety of a worker.

(5) The initiation of all underwater charges shall be under the direct control of the diving supervisor.

PART VIII - DIVING RECORDS

DIVER'S PERSONAL LOG BOOK

64. (1) A diver shall maintain a personal log book that,

(a) is permanently bound;

(b) has numbered pages;

(c) contains his or her name, signature and photograph; and

(d) contains any factor relevant to the diver's safety or health.

(2) A diver shall retain the personal log book for five years after its completion.

(3) A diver shall have entered in or attached to his or her personal log book,

(a) a record of any certificates of qualification obtained that are currently valid;

(b) his or her diver's certificate or equivalent document;

(c) a certificate confirming successful completion of any diving courses; and

(d) a record of the diver's training and experience.

(4) The personal log book shall show all entries in chronological order and shall include,

(a) an entry for each dive which shall be witnessed and signed by the supervisor for the dive; and

(b) any entries for medical recompressions or other exposure to hyperbaric environment which shall be witnessed and signed by a physician or diving supervisor.

(5) The personal log book shall contain the following information for each dive, namely,

(a) the type of diving apparatus used;

(b) the gas media breathed;

(c) the time the diver left the surface;

(d) the time at the bottom;

(e) the maximum depth attained;

(f) the time the diver left the bottom;

(g) the time the diver reached the surface;

(h) the time of the surface interval, if a repetitive dive was undertaken;

(i) the decompression table and schedule used;

(j) the date;

(k) the name of the employer and unusual incidents;

(l) the dive location;

(m) the environmental conditions; and

(n) the signature of the diving supervisor.

Note: Adherence to Appendix C and Appendix D of Canadian Standards Association Standard Z275.2-M1982, Occupational Safety Code for Diving Operations, complies with the intent of this subsection.

(6) In addition to the information required in subsection (5), for dives originating from a diving bell, habitat or other submerged base, the diver's personal log shall also record the depth at the base, the time of leaving the base, the greatest depth attained and the time of return to the base.

(7) When a diver undergoes a medical examination, the name and address of the examining physician and the date of examination shall be recorded in the diver's personal log, along with a copy of the written statement of the physician obtained in accordance with subsection 34(4).

DAILY RECORD

65. (1) A daily record of each dive shall be kept by the diving supervisor and filed with the employer.

(2) The employer shall retain the daily record for at least five years.

(3) The diving supervisor shall make a tape recording of all communications between divers or 1-atmosphere diving system pilots and members of the diving crew during the pre-dive systems checks and the diving operation itself.

(4) The tape recording shall be retained by the diving supervisor for at least forty-eight hours after the completion of the diving operation.

66. This Regulation comes into force ninety days after the day it is filed with the Registrar of Regulations.

CODE FOR THE MEDICAL EXAMINATION OF DIVERS

MINISTRY OF LABOUR
OCCUPATIONAL HEALTH AND SAFETY DIVISION
October 24, 1984

MEDICAL EXAMINATION

1. **Purpose**

The objective of the medical examination is to protect the health of divers by:

(1) ensuring fitness for exposure to changes in atmospheric pressure (compression and decompression);

(2) evaluating the effect of changes in atmospheric pressure on divers;

(3) enabling remedial action to be taken when necessary;

(4) providing health education.

2. **Medical Examination**

The medical examination shall include the following:

(1) Medical and Occupational History;

(2) Physical Examination;

(3) Clinical tests;

(4) Determination of fitness;

(5) Health education.

3. **Screening and Occupational History**

At the medical examination the examining physician shall review the diver's personal log if the diver has been previously assessed under the Regulation. A screening questionnaire shall be administered at the examination to identify any history of seizures, syncope, insulin dependent diabetes mellitus, coronary artery disease, sickle cell trait, middle ear surgery, Meniere's disease, lung cysts and blebs, asthma, alcoholism, chronic obstructive or restrictive lung disease, hiatal hernia, recent bone fracture, drug abuse, psychosis, spontaneous pneumothorax, regular medications, aseptic bone necrosis, residual neurological deficit or duodenal ulcer.

An occupational history shall be undertaken to identify

(a) previous exposure to changes in atmospheric pressures (both occupational and non-occupational);

(b) history of frequency and duration of exposure to changes in atmospheric pressure since previous examination;

(c) history of signs and symptoms that may indicate prior injury as a result of compression or decompression injury such as middle ear trauma, air embolism, decompression sickness, oxygen convulsions, vestibular damage, high pressure neurological syndrome (HPNS) and aseptic bone necrosis.

4. Physical Examination

During the physical examination, particular attention shall be directed to those systems which may be affected by changes in atmospheric pressure and stress involved in diving, for example, cardiopulmonary, ENT, MSS and CNS.

5. Clinical Tests

Clinical tests aid in the assessment of a diver's fitness for and continued exposure to changes in atmospheric pressure and the stress involved in diving.

(1) Pulmonary Function Tests

Pulmonary function tests shall be undertaken at initial examination and annually when indicated. They shall include FVC, FEV_1, FEV_1/FVC ratio, FEF 25-75% or other equivalent flow rate. All measurements are to be corrected to body temperature and pressure (BTPS). The instruments shall be calibrated to currently applied standards as published in the "Snowbird Workshop on Standardization of Spirometry", American Review of Respiratory Illness, Vol. 119, 831 - 838, 1979.

(2) X-rays

(a) A chest X-ray (full inspiration and full expiration views) shall be taken to exclude cysts in the lungs.

(b) Long bones shall be X-rayed initially, then annually, where aseptic necrosis is suspected. (antero-posterior (AP) views of hips and shoulders, lateral views of knees.)

(3) ECG (with exercise tolerance tests when indicated)

Treadmill exercise tests and ECG may be undertaken since contingencies of underwater work may at any time impose an unexpected need for very high levels of energy expenditures.

(4) Audiogram

An audiogram shall be taken to ensure hearing acuity, then annually thereafter.

(5) Pressure Tolerance Test

At the discretion of the examining physician, a pressure tolerance test may be undertaken to test a diver's response to changes in pressure.

(6) At the discretion of the examining physician, other tests including psychometric testing and psychiatric examination may be undertaken.

6. Determination of Fitness

Absolute contra-indications

The diver should be declared medically unfit where any of the following contra-indications are revealed:

(a) Any chronic illness that decreases fitness or the ability to cope with stress;

(b) Any respiratory or cardiovascular impairment (T.B., asthma, emphysema, lung bullae, pneumothorax, myocardial damage, uncontrolled hypertension, vascular insufficiency);

(c) Chronic sinusitis or otitis media, history of stapedectomy;

(d) Inner ear barotrauma (perilymphatic fistula);

(e) Psychiatric disorders;

(f) Alcoholism; or

(g) Drug addiction or abuse of any sort.

Relative contra-indications

It should be seriously considered that the diver be declared unfit when any of the following are present:

(a) Lack of physical fitness;

(b) Gross obesity;

(c) Osteonecrosis in the femur or humerus; or

(d) Musculoskeletal impairments, other than minor.

In some cases, if the situation can be remedied or if the diver is fully apprised of the risks of disease progression and is willing to take those risks, the diver may be declared fit with limitations.

There is no evidence that age is a reason for declaring a diver unfit, provided that his exercise tolerance and medical status are

adequate for strenuous physical activity. Obviously, candidates over age 40 must be screened very carefully.

7. **Health Education**

All divers shall be made aware of the hazards of changes in atmospheric pressure and diving, and their examination results shall be discussed.

Regulations made under the Occupational Health and Safety Act
Revised Statutes of Ontario, 1980, Chapter 321 as at March 31, 1987

Acrylonitrile:	O. Reg. 733/84 as amended by O. Reg. 23/87.
Arsenic:	O. Reg. 176/86 as amended by O. Reg. 23/87.
Asbestos:	O. Reg. 570/82 as amended by O. Reg. 655/85, O. Reg. 23/87.
Asbestos on Construction Projects and in Building and Repair Operations:	O. Reg. 654/85.
Benzene:	O. Reg. 732/84 as amended by O. Reg. 23/87.
Biological or Chemical Agents, Control of Exposure to:	O. Reg. 654/86 as amended by O. Reg. 707/86.
Coke Oven Emissions:	O. Reg. 517/82 as amended by O. Reg. 23/87.
Construction Projects:	R.R.O. 1980, Reg. 691 as amended by O. Reg. 635/86.
Critical Injury Defined:	O. Reg. 714/82.
Diving Operations:	O. Reg. 634/86.
Elevated or Suspended Work Places on Building Facades:	O. Reg. 156/84.
Ethylene Oxide:	O. Reg. 146/87.
Fire Fighters Protective Equipment:	O. Reg. 125/83.
Industrial Establishments:	R.R.O. 1980, Reg. 692.
Isocyanates:	O. Reg. 455/83 as amended by O. Reg. 23/87.
Lead:	O. Reg. 536/81 as amended by O. Reg. 23/87.
Mercury:	O. Reg. 141/82 as amended by O. Reg. 23/87.
Mines and Mining Plants:	R.R.O. 1980, Reg. 694 as amended by O. Reg. 226/83, O. Reg. 569/83, O. Reg. 365/86, O. Reg. 450/86, O. Reg. 569/86, O. Reg. 654/86.
Oil and Gas-Offshore:	O. Reg. 633/86.
Silica:	O. Reg. 769/83 as amended by O. Reg. 23/87.
Teachers:	O. Reg. 191/84.
University Academics and Teaching Assistants:	O. Reg. 307/84.
Vinyl Chloride:	O. Reg. 516/82 as amended by O. Reg. 23/87.
X-Ray Safety:	O. Reg. 632/86.

Regulations made under the Occupational Health and Safety Act Revised Statues of Ontario 1980, Chapter 321 as at March 31, 1987 (cont'd.)

Inventory of Agents or Combinations of Agents for the Purpose of Section 21 of the Act: R.R.O. 1980, Reg. 693.

For a complete reference to the Regulations made under the Occupational Health and Safety Act, recourse should be made to the Annual Consolidated Index to the Regulations of Ontario.

MINISTRY OF LABOUR DISTRICT OFFICES

Barrie
Industrial Health and Safety
114 Worsley Street
L4M 1M1
(705) 722-6642
1-800-461-4383*

Elliot Lake
Mining Health and Safety
Algo Centre
151 Ontario Avenue
P5A 2T2
(705) 848-2885

Hamilton
119 King Street West
L8N 3Z9
Construction Health and Safety
Industrial Health and Safety
(416) 521-7736
1-800-263-6906(8)*

Kingston
1055 Princess Street, Suite 105
K7L 1H3
Construction Health and Safety
Industrial Health and Safety
(613) 545-4340
1-800-267-0915*
Mining Health and Safety
(Suite 301)
(613) 545-4335
1-800-267-0915*

Kirkland Lake
Mining Health and Safety
38 Second Street
P2N 1R1
(705) 567-5241

Kitchener
824 King Street West
N2G 1G1
Construction Health and Safety
Industrial Health and Safety
(519) 744-8101
1-800-265-2373*

London
205 Oxford Street East
N6A 5G6
Construction Health and Safety
Industrial Health and Safety
Mining Health and Safety
(519) 439-3231
1-800-265-4707*

North Bay
Industrial Health and Safety
1500 Fisher Street
Northgate Square
P1B 2H3
(705) 476-2711
1-800-461-1654*

Ottawa
2197 Riverside Drive
K1H 7X3
Construction Health and Safety
Industrial Health and Safety
(613) 523-7530
1-800-267-1916*

Peterborough
139 George Street North
K9J 3G6
Construction Health and Safety
(705) 742-3436
1-800-461-1425*
Industrial Health and Safety
(705) 876-1800
1-800-461-1425*

Richmond Hill
Mining Health and Safety
10720 Yonge Street
L4C 3C9
(416) 884-6551
1-800-268-3829*

St. Catharines
205 King Street
L2R 3J5
Construction Health and Safety
Industrial Health and Safety
(416) 682-7261
1-800-263-7260*

Sarnia
Industrial Health and Safety
700 Christina Street North
N7V 3C2
(519) 336-1200
1-800-265-1416*

Sault Ste. Marie
390 Bay Street
P6A 1X2
Construction Health and Safety
Industrial Health and Safety
(705) 949-3331
1-800-461-7268*

Sudbury
199 Larch Street
P3E 5P9
Construction Health and Safety
Industrial Health and Safety
(705) 675-4455
1-800-461-4000*
Mining Health and Safety
(705) 675-4464
1-800-461-4000*

Sudbury
260 Cedar Street
P3B 3X2
Mining Health and Safety
(Chief Engineers)
(705) 675-4468
1-800-461-4000*

Thunder Bay
435 James Street South
P7E 6E3
Construction Health and Safety
Industrial Health and Safety
(807) 475-1691
1-800-465-5016(7)*
Mining Health and Safety
(807) 475-1675
1-800-465-5016(7)*

Timmins
273 Third Avenue
P4N 1E2
Construction Health and Safety
Industrial Health and Safety
Mining Health and Safety
(705) 267-6231
Zenith 57740* (Mining)

Toronto East
2500 Lawrence Avenue East
Scarborough
M1P 2R7
Construction Health and Safety
Industrial Health and Safety
(416) 750-3557

Toronto West
2 Robert Speck Parkway
Mississauga
L4Z 1H8
Construction Health and Safety
Industrial Health and Safety
(416) 273-7800
1-800-268-2966(7)*

Windsor
500 Ouellette Avenue
Suite 305
N9A 1B3
Construction Health and Safety
Industrial Health and Safety
(519) 256-8278
1-800-265-5140(4)*

Occupational Health Branch Laboratory
101 Resources Road
Weston, Ontario
M9P 3T1
(416) 248-7261

Head Office
400 University Avenue
Toronto, Ontario
M7A 1T7

Construction Health and Safety
(416) 965-7161
1-800-268-8013*
Industrial Health and Safety
(416) 965-4125
1-800-268-8013*

Mining Health and Safety
(416) 965-1328
1-800-268-8013*
Occupational Health
(416) 965-3211
1-800-268-8013*
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(416) 965-2493
1-800-268-8013*
Standards and Programs
(416) 965-8710
1-800-268-8013*

*Toll free line. For callers located within the area code but outside the local calling area of this city. Consult the blue pages in your local telephone directory for additional information. The Ministry may also be reached 24 hours a day through the emergency telephone number in Toronto (416) 965-1211.